noticed in October, 1852, and as yet he could give no satisfactory explanation of it, nor of the singular shape of the shadow, the convexity of which was towards the ball, instead of from it, as it might be expected to be. His observations were made with the great Cambridge Refractor in the years 1852, 1854, and 1855.

Four hundred and twelfth meeting.

March 13, 1855. — MONTHLY MEETING.

The PRESIDENT in the chair.

Professor Lovering alluded to the fact, that at a previous meeting the opinion of Arago had been referred to as favorable to making the subject of "Table-moving," so called, a matter of scientific investigation. Since that meeting he had himself examined the new edition of Arago's complete works, and had found nothing to justify such a conclusion; on the contrary, he found that Arago declared himself satisfied that the appearances in question are founded in imposture.

Four hundred and thirteenth meeting.

April 10, 1855. — MONTHLY MEETING.

The PRESIDENT in the chair.

After the record of the preceding meeting was read and approved, Professor Agassiz confirmed from his own knowledge the statement of Professor Lovering at the preceding meeting concerning Arago's opinions of the so-called "Spiritual Manifestations." And yet, he said, notwithstanding the unanimous opinion of the committee of the French Academy, to which the subject had been referred, that the whole thing is a matter of imposture, the authority of that learned body and that great philosopher is constantly appealed to as favorable to the alleged reality of the appearances in question.

Professor Agassiz made a communication on the subject of the classification of Polyps. He remarked that Cuvier in-

cluded under Polypi what are now known as Hydroids and Bryozoa. Milne-Edwards has demonstrated that the latter are not Polypi, — their structure not being truly radiate, — but the lowest order of Mollusks; and he called them Molluscoids. Polypi and Hydroids, however, are still grouped together. By Ehrenberg these are called Anthozoa, — which he divides, further, into two groups: Zoöcoralia those which are free, and Phytocoralia, those which are attached; but under these groups he has made a very unnatural distribution of the families, as the young and adult of the same species may differ in this respect, the young being sometimes attached, when the adult is free. Professor Agassiz exhibited in illustration a specimen of *Manicina areolata* from Florida, the young of which are sessile, whilst the adults are free. Milne-Edwards subdivided Polypi into Actinoids, Alcyonoids, and Sertularians, which he considers as coequal groups, a division chiefly based on the character of the tentacles and calycle; but Professor J. D. Dana has at last shown that the first two form one natural group, and the Sertularians another, thus for the first time uniting the types of the class of Polyps together into one division. Professor Agassiz is however of opinion, that the Hydroids should be removed from the class of Polypi, and referred to that of Acalephæ. They are pedunculated Medusæ in the same sense that Crinoids are pedunculated Asteroids. The true Polypi are divided by Dana into two orders, the Actinarians and Alcyonoids. Professor Agassiz thinks he has detected indications of superiority and inferiority of structure between these orders, founded on the structure and number of the tentacles, &c. Thus in Alcyonoids these are fringed and definite in number and position, being two in the long axis, and in three pairs on the sides, while in Actinoids they are simple, and there is not the same regularity of number and position. The former should therefore be regarded as ranking higher than the latter. Among Actinoid Polyps some are simple, while others are compound individuals. The former would at first seem to stand highest in the scale, whereas they

are in reality the lowest, as their tentacles are indefinite in number. Among the Actinoids there are species provided at first with one mouth, which afterwards contracts and divides into two, each being surrounded by its row of tentacles, the animal being thus double above, but single below; and the division may be repeated, so that the number of mouths shall be four, belonging apparently to as many individuals, while in reality they are but one, being united below. The multiplication is indefinite in many types. Such a peculiar structure naturally leads to the question, What defines the individual in this case, — the possession of a single mouth, or the union of all the branches below? In Meandrina a number of mouths are surrounded by a single row of tentacles, and there is one common digestive cavity. In a Madrepore, which has sprung from a single egg, the main polyp may preserve its position at the top of the stem, while buds are pushed out from the stem, constituting a community of individuals subordinate to the principal one. This shows distinctly that polyp communities are combining into higher unities. Among some of the Alcyonoids, as in Renilla, Pennatela, &c., a community of individuals based upon a single stem, each polyp being provided with its own set of tentacles, and all communicating with a common cavity, has the power of changing its position and moving about freely, exhibiting a new kind of individuality, a community moving as a single individual. Among the Polypi, then, the compound individual presents the higher type, and Alcyonoids, which are all compound animals, are higher than Actinoids, among which alone simple polyps are found. This position accords with the revelations of geology, the former never occurring as fossils in ancient formations, while the latter have built up all the coral formations of past geological epochs. Dana has shown that the Actinoids bud in two ways, some dividing at the top, others budding laterally. Professor Agassiz regards the Madrepores as the highest, on account of their tentacles being definite in number, and some preserving a top animal; next he places

the top budders (Asteroids), while those that bud laterally (the Caryophyllians) rank lowest. This order of arrangement corresponds in general to the geological succession of Polypi from the lowest formations upward. Again, every coral reef rising from the bottom of the ocean shows in its various stages a succession of species reminding us of the same general plan.

Professor Agassiz remarked, that the study of this class of animals is greatly embarrassed by difficulties growing out of the fact, that the general features vary much in communities of the same species, so that these features cannot be so much depended upon for characters as the intimate structure of the individual polyps. He was inclined to believe that many of the genera of this class recently described by naturalists are based on evanescent characters, in fact upon different stages of development of well-known types.

Dr. A. A. Hayes called the attention of the Academy to a new species of wax, a specimen of which was on the table, and made the following remarks: —

"The commercial relations of our country, extending along the rivers of South America, are making known to us the products of the vast forests of the interior, many of which have a high value in the arts and are new to commerce. Among specimens received by me is the peculiar wax before us, respecting the origin of which I possess only a meagre amount of information. 'It is obtained by boiling the deep green leaves of a shrub resembling laurel, abounding in the forests back from Para and Bahia, and is used to some extent as a substitute for wax in the manufacture of candles.'

"This wax has a light tint of greenish-yellow color, transmitting nearly white light through thin portions; it is hard, the angles of the fragments scratching gypsum. Its fracture is slightly conchoidal, lustre more dull than that of ordinary wax. By rubbing, it becomes electrically excited, and takes and retains a fine polish; it is brittle, without softening when compressed between the fingers.

"The average sp. gr., determined on many specimens, is at 60° F. 1.000, or the same as distilled water. When heated to 120° F. for some time, it loses moisture, and exhales a pleasant balsamic odor, not unlike that of pinks.

" 100 parts at 212° F. became a transparent fluid after frothing, having lost 2.10 per cent of volatile matter, this being mostly aqueous moisture due to the process of manufacturing it, and the dry wax on cooling becomes slightly darker in color. Made into candles, it burns with a deep opaque yellow flame, a thin stream of smoke creeping from the apex; its decomposition in this way showing an excess of carbon, as the carbo-hydrogens burn in the air. This important character forbids its application as a substitute for wax, or for affording light in confined spaces; otherwise, its high melting-point would render it very valuable in many situations, when our ordinary materials fail. When mixed with tallow, the latter becomes harder, and the *apparent* melting-point of the mixture is higher than that of tallow. But the resulting mixed mass softens at a temperature of 100° F., and the new wax does not break up in the act of combustion, so as to unite with the carbo-hydrogens of the tallow, with which it is mixed. Its application in this way does not therefore promise a valuable result.

" Alcohol of sp. gr. 0.821, when boiled on the dried wax, dissolves a small portion, which separates in part by cooling, in the form of a hydrous mass, becoming white. The cold solution evaporated disengages a balsamic odor; the coating it leaves, when dry, has the characters of the original wax.

" In sulphuric ether, the same characters are preserved, the matter dissolved being identical with the original wax.

" Benzole is the appropriate solvent for this wax; it melts in it, dissolving largely, so that on cooling the solution becomes a soft mass. A more dilute solution allows the pure wax to deposit in beautiful snow-white granules, which, while wet, are transparent, becoming opaque on drying. These granules when magnified appear generally to be composed of aggregations of spherules, forming mammillary concretions; but in rare cases radiating lines occur within them, indicating the existence of a polarizing force too feeble to form a rectilinear solid.

" Chloroform dissolves the wax freely, and the results of cooling and evaporation are the same as occur with benzole.

" These characters sufficiently prove that this wax does not, like many other kinds, divide into a more fluid and a more solid body, when subjected to the action of solvents; and its unity in this respect is its most strongly marked peculiarity.

" In alkaline solutions, by ordinary treatment, no saponification takes place, after long boiling. The wax retains a little alkali after it has been washed in water, and the compound is to a small extent soluble in water, but has not the characters of soap. This alkaline wax will absorb a considerable quantity of an alkaline solution, in which it has been boiled; washing in water removes the excess of alkali, no definite compound being formed.

" When distilled from a nearly closed vessel, it leaves 0.44 per cent of carbon and ash, the latter amounting to .10 only.

" This wax can be supplied, should a want exist commercially, at a price intermediate between that of tallow and the ordinary wax. The only application at present known in which it exhibits useful properties is in forming a basis for a preparation used in waxing furniture and polished wood-work."

Mr. J. H. Abbot exhibited profiles of two routes for the Pacific Railroad, drawn by order of government; also profiles of the highest grades of all the working railroads of the United States. He also exhibited a mineral from a digging in California, taken twenty feet below the surface. It was a remarkably pure specimen of *hydrate of alumina*, with a minute quantity of *hydrate of silica.*

Mr. T. S. Hunt made a communication on the chemical law of equivalent volumes. He showed that the law applies to all solid bodies that are homœomorphous.

Dr. Durkee exhibited under the microscope the circulation of the contents of the cell of *Chara.*

Four hundred and fourteenth meeting.

May 8, 1855. — MONTHLY MEETING.

The PRESIDENT in the chair.

Professor Agassiz stated that, since the preceding meeting, he had received one hundred and fifty specimens of one and the same species of coral, *Mussa angulosa*, Oken, the examination of which had satisfied him of the truth of his observations at the previous meeting, that many of the species described by authors are but immature specimens of species